Amendments to the Claims

Please cancel Claims 1, 2, 23, 28, 32-35, 61, 65-68, 70 and 71. Please amend Claims 3, 4, 6, 8, 10-14, 16, 19, 20, 24, 29, 31, 36, 37, 39, 41, 44, 45, 46, 47, 49, 52-57, 62 and 64. The Claim Listing below will replace all prior versions of the claims in the application:

Claim Listing

1, 2 (Canceled)

3. (Currently Amended) A network router as claimed in claim [[2]] 6 wherein the scheduler limits comparisons of scheduling values to a path through the tree structure from a leaf node representing a changed scheduling value to a root of the tree structure.

4. (Currently Amended) A network router as claimed in claim [[2]] 6 wherein the internal nodes of the tree structure store scheduling values from winning sibling nodes.

5. (Original) A network router as claimed in claim 4 wherein the internal nodes store identities of leaf nodes corresponding to the stored scheduling values.

6. (Currently Amended) ~~A network router as claimed in claim 2 wherein the scheduler comprises~~ A network router comprising:

queues storing data packets to be forwarded; and

a scheduler which selects queues from which packets are forwarded, the scheduler comprising:

scheduling values associated with the queues;

a selection network by which the scheduling values are compared to select packets to be forwarded, the selection network being a tree structure where each leaf of the tree structure represents a scheduling value of a queue and internal nodes of the tree structure represent winners in comparisons of scheduling values of sibling nodes of the tree structure; and

a random access memory (RAM) for storing the tree structure, an address register which stores an address to access from the RAM a scheduling value to be compared, a compare register which stores a scheduling value to be compared to the scheduling value from the RAM and a comparator for comparing the scheduling values.

7. (Original) A network router as claimed in claim 6 wherein the scheduler further comprises hardware which receives the address in the address register and determines a sibling node where a scheduling value to be compared is stored, and determines a parent node address at which a winning compared scheduling value is stored.

8. (Currently Amended) A network router as claimed in claim [[2]] 6 wherein the scheduler comprises pipeline stages, each of which compares scheduling values indicated by separate portions of the tree structure.

9. (Original) A network router as claimed in claim 8 wherein the scheduler comprises a random access memory partitioned across the pipeline stages, each partition storing at least one level of the tree structure.

10. (Currently Amended) ~~A network router as claimed in claim 9 wherein the scheduler further comprises in each pipeline stage~~ A network router comprising:

queues storing data packets to be forwarded; and

a scheduler which selects queues from which packets are forwarded, the scheduler comprising:

scheduling values associated with the queues;

a selection network by which the scheduling values are compared to select packets to be forwarded;

a random access memory partitioned across pipeline stages, each pipeline stage comparing scheduling values indicated by separate portions of the tree structure and each partition storing at least one level of the tree structure; and

an address register in each pipeline stage which stores an address to access from the RAM a scheduling value to be compared, a compare register which stores a scheduling value to be compared to a scheduling value from the RAM and a comparator for comparing the scheduling values.

11. (Currently Amended) A network router as claimed in claim [[2]] 6 wherein each node identifies a path to a winning leaf node.

12. (Currently Amended) ~~A network router as claimed in claim 11 comprising~~ A network router comprising:

queues storing data packets to be forwarded; and

a scheduler which selects queues from which packets are forwarded, the scheduler comprising:

scheduling values associated with the queues;

a selection network by which the scheduling values are compared to select packets to be forwarded, the selection network being a tree structure where each leaf of the tree structure represents a scheduling value of a queue and internal nodes of the tree structure represent winners in comparisons of scheduling values of sibling nodes of the tree structure, with each node identifying a path to a winning leaf node; and

a random access memory which stores leaf nodes, a flip-flop array which identifies the winner at each internal node and a comparator for comparing scheduling values of the leaf nodes from the RAM indicated by the data stored in the flip-flop array.

13. (Currently Amended) A network router as claimed in claim [[2]] 6 further comprising an indicator associated with each queue to disable the queue from scheduling.

14. (Currently Amended) A network router as claimed in claim [[2]] 6 wherein the scheduling values include scheduled transmission times according to a constant-bit-rate (CBR) service guarantee.

15. (Original) A network router as claimed in claim 14 wherein the scheduling values are updated to reflect variable packet links.

16. (Currently Amended) ~~A network router as claimed in claim 14~~ A network router comprising:

queues storing data packets to be forwarded; and

a scheduler which selects queues from which packets are forwarded, the scheduler comprising:

scheduling values associated with the queues, the scheduling values including scheduled transmission times according to a constant-bit-rate (CBR) guarantee wherein the scheduling values are updated to reflect byte stuffing applied to a prior packet; and

a selection network by which the scheduling values are compared to select packets to be forwarded, the selection network being a tree structure where each leaf of the tree structure represents a scheduling value of a queue and internal nodes of the tree structure represent winners in comparisons of scheduling values of sibling nodes of the tree structure.

17. (Original) A network router as claimed in claim 14 further comprising scheduling values which represent theoretical transmission times using a weighted-fair-queuing (WFQ) scheduling policy.

18. (Original) A network router as claimed in claim 17 wherein the WFQ scheduling values are updated for variable packet lengths.

19. (Currently Amended) ~~A network router as claimed in claim 17~~ A network router comprising:

queues storing data packets to be forwarded; and

a scheduler which selects queues from which packets are forwarded, the scheduler comprising:

scheduling values associated with the queues, the scheduling values including scheduled transmission times according to a constant-bit-rate (CBR) guarantee and representing theoretical transmission times using a weighted-fair-queuing (WFQ) scheduling policy wherein the scheduling values are updated to reflect byte stuffing applied to a prior packet; and

a selection network by which the scheduling values are compared to select packets to be forwarded, the selection network being a tree structure where each leaf of the tree structure represents a scheduling value of a queue and internal nodes of the tree structure represent winners in comparisons of scheduling values of sibling nodes of the tree structure.

20. (Currently Amended) A network router as claimed in claim [[2]] 6 further comprising scheduling values which represent theoretical transmission times using a weighted-fair-queuing (WFQ) scheduling policy.

21. (Original) A network router as claimed in claim 20 wherein the WFQ scheduling values are updated for variable packet lengths.

22. (Original) A network router as claimed in claim 20 wherein the scheduling values are updated to reflect byte stuffing applied to a prior packet.

23. (Canceled)

24. (Currently Amended) ~~A network router comprising:~~

~~queues storing data packets to be forwarded; and~~

~~a scheduler which selects queues from which packets are forwarded, the scheduler comprising:~~

~~scheduling values associated with the queues,~~

A network router as claimed in claim 6, wherein the scheduler further comprises indicators associated with the queues to disable the queues, and wherein the selection network~~, and a comparator which~~ compares scheduling values of queues which are not disabled to forward data packets therefrom.

25. (Original) A network router comprising:

queues storing data packets to be forwarded; and

a scheduler which selects queues from which packets are forwarded, the scheduler comprising:

first scheduling values corresponding to a first scheduling method associated with a first subset of queues;

second scheduling values corresponding to a second scheduling method associated with a second subset of queues, at least one queue being a member of each of the first subset and second subset of queues; and

a queue selector by which first scheduling values are compared and second scheduling values are compared to select packets to be forwarded.

26. (Original) A network router as claimed in claim 25 wherein the first scheduling method is constant bit rate (CBR) scheduling and the second scheduling method is weighted-fair-queuing (WFQ) scheduling.

27. (Original) A network router as claimed in claim 26 wherein the scheduler selects a queue by:

identifying an earliest scheduled CBR queue;

if the scheduling value of the identified CBR queue is less than or equal to a current time, transmitting a corresponding packet from the CBR queue and updating the CBR scheduling value associated with the queue; and

otherwise, transmitting a packet from a WFQ queue having an earliest scheduling value and updating the scheduling value of that queue.

28. (Canceled)

29. (Currently Amended) ~~A network router as claimed in claim 28 wherein~~ A network router comprising:

queues storing data packets to be forwarded; and

a scheduler which selects queues from which packets are forwarded, the scheduler comprising:

scheduling values associated with the queues, the scheduling values ~~are~~ being updated to reflect byte stuffing applied to a prior packet;

a selector by which scheduling values are compared to select packets to be forwarded; and

a scheduling value updater which updates the scheduling value of a queue based on a variable length of a packet in the queue.

30. (Original) A network router as claimed in claim 29 wherein the scheduler selects a queue by:

identifying an earliest scheduled CBR queue;

if the scheduling value of the identified CBR queue is less than or equal to a current time, transmitting a corresponding packet from the CBR queue and updating the CBR scheduling value associated with the queue; and

otherwise, transmitting a packet from a WFQ packet having an earliest scheduling value and updating the scheduling value of that queue.

31. (Currently Amended) ~~A network router as claimed in claim 28~~ A network router comprising:

queues storing data packets to be forwarded; and

a scheduler which selects queues from which packets are forwarded, the scheduler comprising:

scheduling values associated with the queues;

a selector by which scheduling values are compared to select packets to be forwarded; and

a scheduling value updater which updates the scheduling value of a queue based on a variable length of a packet in the queue;

wherein the scheduler ~~comprises~~ selects a queue by:

identifying an earliest scheduled CBR queue;

if the scheduling value of the identified CBR queue is less than or equal to a current time, transmitting a corresponding packet from the CBR queue and updating the CBR scheduling value associated with the queue; and

otherwise, transmitting a packet from a WFQ packet having an earliest scheduling value and updating the scheduling value of that queue.

32-35 (Canceled)

36. (Currently Amended) A method as claimed in claim [[35]] 39 wherein the scheduler limits comparisons of scheduling values to a path through the tree structure from a leaf node representing a changed scheduling value to a root of the tree structure.

37. (Currently Amended) A method as claimed in claim [[35]] 39 wherein the internal nodes of the tree structure store scheduling values from winning sibling nodes.

38. (Original) A method as claimed in claim 37 wherein the internal nodes store identities of leaf nodes corresponding to the stored scheduling values.

39. (Currently Amended) ~~A method as claimed in claim 35~~ A method of routing data packets comprising:

storing data packets in queues;

associating scheduling values with the queues; and

comparing scheduling values in a selection network to select queues from which packets are forwarded, the selection network being a tree structure where each leaf of the tress structure represents a scheduling value of a queue and internal nodes of the tree structure represent winners in comparisons of scheduling values of sibling nodes of the tree structure wherein the tree structure is stored in a random access memory (RAM) and scheduling values from a compare register and from the RAM are compared.

40. (Original) A method as claimed in claim 39 further comprising determining a sibling node where a scheduling value to be compared is stored, and determining a parent node address at which a winning compared scheduling value is stored.

41. (Currently Amended) A method as claimed in claim [[35]] 39 further comprising comparing scheduling values indicated by separate portions of the tree structure in pipeline stages.

42. (Original) A method as claimed in claim 41 further comprising storing at least one level of the tree structure in a partition of a random access memory (RAM) partitioned across the pipeline stages.

43. (Original) A method as claimed in claim 42 further comprising, in each pipeline stage, comparing scheduling values from a compare register and from the RAM.

44. (Currently Amended) A method as claimed in claim [[35]] 39 wherein each node identifies a path to a winning leaf node.

45. (Currently Amended) A method as claimed in claim 44 wherein leaf nodes of the tree structure are stored in [[a]] the random access memory and the winner at each internal node is identified in a flip-flip array, the method comprising comparing scheduling values of the leaf nodes from the RAM indicated by the data stored in the flip-flop array.

46. (Currently Amended) A method as claimed in claim [[34]] 39 further comprising providing an indicator associated with each queue to disable the queue from scheduling.

47. (Currently Amended) A method as claimed in claim [[34]] 39 wherein the scheduling values include scheduled transmission times according to a constant-bit-rate (CBR) service guarantee.

48. (Original) A method as claimed in claim 47 wherein the scheduling values are updated to reflect variable packet lengths.

49. (Currently Amended) ~~A method as claimed in claim 47 wherein~~ A method of routing data packets comprising:

storing data packets in queues;

associating scheduling values with the queues; and

comparing scheduling values in a selection network to select queues from which packets are forwarded, the scheduling values including scheduled transmission times according to a constant-bit-rate (CBR) service guarantee; and

updating the scheduling values ~~are updated~~ to reflect byte stuffing applied to a prior packet.

50. (Original) A method as claimed in claim 47 wherein scheduling values represent theoretical transmission times using a weighted-fair-queuing (WFQ) scheduling policy.

51. (Original) A method as claimed in claim 50 wherein the WFQ scheduling values are updated for variable packet lengths.

52. (Currently Amended) ~~A method as claimed in claim 50 wherein~~ A method of routing data packets comprising:

storing data packets in queues;

associating scheduling values with the queues;

comparing scheduling values in a selection network to select queues from which packets are forwarded, the scheduling values including scheduled transmission times according to a constant-bit-rate (CBR) service guarantee and representing transmission times using a weighted-fair-queuing (WFQ) scheduling policy; and

updating the scheduling values ~~are updated~~ to reflect byte stuffing applied to a prior packet.

53. (Currently Amended) A method as claimed in claim [[34]] 39 wherein scheduling values represent theoretical transmission times using a weighted-fair-queuing (WFQ) scheduling policy.

54. (Currently Amended) A method as claimed in claim [[53]] 39 wherein the WFQ scheduling values are updated for variable packet lengths.

55. (Currently Amended) ~~A method as claimed in claim 53 wherein~~ A method of routing data packets comprising:

storing data packets in queues;

associating scheduling values with the queues; and

comparing scheduling values in a selection network to select queues from which packets are forwarded, the scheduling values representing transmission times using a weighted-fair-queuing (WFQ) scheduling policy; and

updating the scheduling values ~~are updated~~ to reflect byte stuffing applied to a prior packet.

56. (Currently Amended) A method as claimed in claim [[34]] 49 wherein the selection network is a sorting network by which the scheduling values are compared to order the queues by scheduling priority.

57. (Currently Amended) ~~A method of routing data packets comprising:~~

~~storing data packets in queues;~~

~~associating scheduling values with the queues;~~

~~associating indicators with the queues to disable the queues; and~~

A method as claimed in claim 39 further comprising associating indicators with the queues to disable the queues, wherein comparing scheduling values further comprises:

comparing scheduling values of queues which are not disabled before the data packets therefrom.

58. (Original) A method of routing data packets comprising:

storing data packets in queues;

associating scheduling values corresponding to a first scheduling method with a first subset of queues;

associating scheduling values corresponding to a second scheduling method with a second subset of queues, at least one queue being a member of each of the first subset and second subset of queues; and

comparing scheduling values to select packets to be forwarded, excess capacity under the first scheduling method being available for scheduling under the second scheduling method.

59. (Original) A network router as claimed in claim 58 wherein the first scheduling method is constant bit rate (CBR) scheduling and the second scheduling method is weighted-fair-queuing (WFQ) scheduling.

60. (Original) A network router as claimed in claim 58 wherein the scheduler selects a queue by:

identifying an earliest scheduled CBR queue;

if the scheduling value of the identified CBR queue is less than or equal to a current time, transmitting a corresponding packet from the CBR queue and updating the CBR scheduling value associated with the queue; and

otherwise, transmitting a packet from a WFQ queue having an earliest scheduling value and updating the scheduling value of that queue.

61. (Canceled)

62. (Currently Amended) ~~A network router as claimed in claim 61 wherein the scheduling values are updated~~ A method of routing data packets comprising:

storing data packets in queues;

associating scheduling values with the queues;

comparing scheduling values to select data packets to be forwarded; and

updating the scheduling value of a queue based on a variable length of a packet in the queue to reflect byte stuffing applied to a prior packet.

63. (Original) A network router as claimed in claim 62 wherein the scheduler selects a queue by:

identifying an earliest scheduled CBR queue;

if the scheduling value of the identified CBR queue is less than or equal to a current time, transmitting a corresponding packet from the CBR queue and updating the CBR scheduling value associated with the queue; and

otherwise, transmitting a packet from a WFQ packet having an earliest scheduling value and updating the scheduling value of that queue.

64. (Currently Amended) ~~A network router as claimed in claim 61~~ A method of routing data packets comprising:

storing data packets in queues;

associating scheduling values with the queues;

comparing scheduling values to select data packets to be forwarded; and

updating the scheduling value of a queue based on a variable length of a packet in the queue;

wherein the scheduler ~~comprises~~ selects a queue by:

identifying an earliest scheduled CBR queue;

if the scheduling value of the identified CBR queue is less than or equal to a current time, transmitting a corresponding packet from the CBR queue and updating the CBR scheduling value associated with the queue; and

otherwise, transmitting a packet from a WFQ packet having an earliest scheduling value and updating the scheduling value of that queue.

65-68 (Canceled)

69. (Original) A network router comprising:

queues storing data packets to be forwarded; and

scheduling means for selecting queues from which packets are forwarded, the scheduling means comprising:

first scheduling values corresponding to a first scheduling method associated with a first subset of queues;

second scheduling values corresponding to a second scheduling method associated with a second subset of queues, at least one queue being a member of each of the first subset and second subset of queues; and

queue selecting means for comparing first scheduling values and second scheduling values to select packets to be forwarded.

70, 71 (Canceled)